

in a second set of movable cameras, distinct from the first set of stationary cameras, wherein each movable camera is automatically directed without user intervention to maintain an independent view of one or more participants and / or objects, where the second set of movable cameras continuously outputs a second stream of video images, and where the second stream of video images is not used to either determine any participant's or object's centroid X, Y coordinates or to otherwise update the tracking database.

Claim 98. (New) The system of claim 97 for further providing a three dimensional model of the activities of at least the participants, comprising:

a third algorithm operated on a computer system responsive to the tracking database and both the first and second streams of video images for determining the ongoing relative X, Y and Z coordinates of one or more specific, non-centroid locations on each participant and for updating the tracking database to include the additional X, Y, Z coordinates of all detected locations.

Claim 99. (New) The system of claim 98 wherein the contiguous view formed by the first set of stationary cameras is substantially parallel to the ground surface within the predefined area.

Claim 100. (New) The system of claim 99 further comprising:

markers adhered onto one or more locations on each participant and / or object to be tracked that reflect, retroreflect or fluoresce energy, where the energy is detectable by the first and / or second set of cameras, and where the third algorithm now detects the adhered markers and updates the tracking database with related X, Y and Z coordinates of each detected marker for forming the three dimensional model of each participants activities.

Claim 101. (New) The system of claim 99 wherein the markers reflect, retroreflect or fluoresce primarily non-visible energy and are therefore substantially visibly transparent, further comprising:

one or more energy sources emitting non-visible energy that is reflected or retroreflected off of the markers, or emitting energy that is fluoresced in the non-visible spectrum by the markers and is detectable by the first and / or second set of movable cameras.

Claim 102. (New) The system of claim 101, wherein the participants and / or objects are additionally identified, further comprising:

at least one uniquely encoded marker adhered onto a top surface of each participant and / or object to be identified that reflects, retroreflects or fluoresces energy, and

a forth algorithm operated on a computer system for locating and recognizing the encoded markers within either the first and / or second stream of video images and for updating the tracking database with each participant's and / or object's identity matched to its coordinates.

Claim 103. (New) The system of claim 102 wherein the uniquely encoded markers reflect, retroreflect or fluoresce primarily non-visible energy and are therefore substantially visibly transparent, further comprising:

one or more energy sources emitting non-visible energy that is reflected or retroreflected off of the markers, or emitting energy that is fluoresced in the non-visible spectrum by the markers and is detectable by the first and / or second set of movable cameras.

Claim 104. (New) The system of claim 97, wherein the participants and / or objects are additionally identified, further comprising:

at least one uniquely encoded marker adhered onto a top surface of each participant and / or object to be identified that reflects, retroreflects or fluoresces energy, and

a forth algorithm operated on a computer system for locating and recognizing the encoded markers within either the first or second stream of video images and for updating the tracking database with each participant's and / or object's identity matched to its coordinates.

Claim 105. (New) The system of claim 104 wherein the uniquely encoded markers reflect, retroreflect or fluoresce primarily non-visible energy and are therefore substantially visibly transparent, further comprising:

one or more energy sources emitting non-visible energy that is reflected or retroreflected off of the markers, or emitting energy that is fluoresced in the non-visible spectrum by the markers and is detectable by the first and / or second set of movable cameras.

Claim 106. (New) The system of claim 97 for videoing the activities of two or more participants, wherein the second set of moveable cameras comprises at least two cameras and wherein the second set is additionally directed to automatically reassign any one or more cameras currently following any one or more participants to instead follow a different one or more participants based upon which camera views may currently be blocked by one participant in front of another.

Claim 107. (New) A system for automatically uniquely identifying and tracking one or more participants, including players and game officials, as well as game objects as they move about within a predefined playing area, during a predefined time such as a sports game, where there is at least one uniquely encoded marker adhered onto a top surface of each participant or object to be uniquely identified that reflects, retroreflects or fluoresces energy, comprising:

- a first set of two or more stationary cameras for generating a first video stream of images that together form a contiguous view that entirely covers the playing area, where the first set of cameras capture video continuously throughout the entire game;

- a first algorithm operated on a computer system responsive to the first stream of video images for simultaneously analyzing the continuous images from each first camera in order to detect the presence of any one or more participants and / or game objects within each and every camera's view, to determine each detected participant's and / or game object's relative centroid X, Y location within that view, to recognize the encoded markers adhered onto a top surface of each participant and / or object thereby determining each participant's and / or object's unique identity, where dimensional characteristics of each detected participant and / or game object, such as its size, may also be determined during the process, and for continuously throughout the entire game combining this determined information from each and every first set camera into a tracking database of at least the ongoing centroid X, Y coordinates of each one or more marked participants and / or game objects matched with their identities, as well as the ongoing centroid X, Y coordinates of one or more non-marked game objects, all relative to the entire playing area.

Claim 108. (New) The system of claim 107 for further automatically videoing the one or more participants as well as game objects as they move about within the predefined playing area, during the predefined time, further comprising:

a second algorithm operated on a computer system responsive to the tracking database, for dynamically adjusting the current view of each one or more cameras in a second set of movable cameras, distinct from the first set of stationary cameras, wherein each movable camera is automatically directed without user intervention to maintain an independent view of one or more participants and / or game objects, where the second set of movable cameras continuously outputs a second stream of video images.

Claim 109. (New) The system of claim 108 for further providing a three dimensional model of the activities of at least the participants, where markers are adhered onto one or more locations on each participant and / or game objects to be modeled that reflect, retroreflect or fluoresce energy and where the energy is detectable by the first and / or second set of cameras, comprising:

a third algorithm operated on a computer system responsive to the tracking database and either or both the first and second streams of video images for first detecting the adhered markers and second updating the tracking database with related X, Y and Z coordinates of each detected marker for forming the three dimensional model of at least the participant's activities.

Claim 110. (New) The system of claim 109 wherein the markers reflect, retroreflect or fluoresce primarily non-visible energy and are therefore substantially visibly transparent, further comprising:

one or more energy sources emitting non-visible energy throughout the playing area that is reflected or retroreflected off of the markers, or emitting energy throughout the playing area that is fluoresced in the non-visible spectrum by the markers and is detectable by the first and / or second set of movable cameras.

Claim 111. (New) A method for automatically videoing the activities of one or more participants and objects as they move about within a predefined area, during a predefined time, comprising the steps of:

capturing a first stream of video images using a first set of two or more stationary cameras, wherein the combined view from all first cameras covers the entire predefined area, and where each first camera provides images continuously throughout the predefined time;

simultaneously analyzing only the continuous images coming from each first camera in order to first detect the presence of any one or more participants and / or objects within each and every camera's view and then to second determine each detected participant's and / or object's relative centroid X, Y location within that view, where dimensional characteristics of each detected participant and / or object, such as its size, may also be determined during this step, and third for continuously during the predefined time combining this determined information from each and every first set camera into a tracking database of at least the ongoing centroid X, Y coordinates of each one or more participants and objects, relative to the entire predefined area;

using the continuously determined centroid X, Y coordinates regarding each participant and object, as captured by the first set of cameras, to automatically and individually direct, without the aid of an user, some combination of at least the pan, tilt and/or zoom movements of a each camera in a second set of one or more movable cameras, distinct from the first set of stationary cameras, and

capturing a continuous second stream of video images using the second set of automatically movable cameras, wherein the images create independent views of one or more of the participants and / or objects within the predefined area.

Claim 112. (New) The method of claim 111 for further providing a three dimensional model of the activities of at least the participants, comprising the step of:

analyzing the tracking database and both the first and second streams of video images to determine the ongoing relative X, Y and Z coordinates of one or more specific, non-centroid locations on each participant and for updating the tracking database to include the additional X, Y, Z coordinates of all detected locations.

Claim 113. (New) The method of claim 112 wherein the contiguous view formed by the first set of stationary cameras is substantially parallel to the ground surface within the predefined area.

Claim 114. (New) The method of claim 113 further comprising the steps of:

placing markers onto one or more locations on each participant and / or object to be tracked that reflect, retroreflect or fluoresce energy;

detecting the reflected, retroreflected or fluoresced energy, using the first and / or second set of cameras, in order to further determine the X, Y and Z coordinates of

each marker using computer based image analysis of the first and second streams of video, and

updating the tracking database to indicate the relative X, Y and Z coordinates of the detected markers matched with the respective participants and / or objects.

Claim 115. (New) The method of claim 114 wherein the markers reflect, retroreflect or fluoresce primarily non-visible energy and are therefore substantially visibly transparent, further comprising the step of:

using one or more energy sources to emit non-visible energy throughout the predefined area, to be reflected or retroreflected off of the markers, or emitting energy that is fluoresced in the non-visible spectrum by the markers, where the non-visible energy is detectable by the first and / or second set of cameras.

Claim 116. (New) The method of claim 115, further comprising the steps of:

placing at least one uniquely encoded marker onto a top surface of each participant and / or object to be identified that reflects, retroreflects or fluoresces energy;

detecting each unique identifier using computer based image analysis of either the first and / or second streams of video, and

updating the tracking database to indicate the identity of each participant and / or object matched to its coordinates.

Claim 117. (New) The method of claim 116 wherein the uniquely encoded markers reflect, retroreflect or fluoresce primarily non-visible energy and are therefore substantially visibly transparent, further comprising the step of:

using one or more energy sources to emit non-visible energy throughout the predefined area, to be reflected or retroreflected off of the markers, or emitting energy that is fluoresced in the non-visible spectrum by the markers, where the non-visible energy is detectable by the first and / or second set of cameras.

Claim 118. (New) The method of claim 111, further comprising the steps of:

placing at least one uniquely encoded marker onto a top surface of each participant and / or object to be identified that reflects, retroreflects or fluoresces energy;

detecting each unique identifier using computer based image analysis of either the first and / or second streams of video, and

updating the tracking database to indicate the identity of each participant and / or object matched to its coordinates.

Claim 119. (New) The method of claim 118 wherein the uniquely encoded markers reflect, retroreflect or fluoresce primarily non-visible energy and are therefore substantially visibly transparent.

Claim 120. (New) The method of claim 111 for videoing the activities of two or more participants, wherein the second set of movable cameras comprising at least two or more cameras and the step for using the detected centroid X, Y coordinates and dimensional characteristics regarding each participant to automatically and individually direct some combination of at least the pan, tilt and/or zoom movements of a each second camera further comprises the step of dynamically considering the location of each participant with respect to the view of each second camera and automatically reassigning any one or more second cameras currently following any one or more participants to instead follow a different one or more participants based upon which camera views may currently be blocked by one participant in front of another.

Claim 121. (New) A method for automatically uniquely identifying and tracking one or more participants, including players and game officials, as well as game objects as they move about within a predefined playing area, during a predefined time such as a sports game, comprising the steps of:

placing at least one uniquely encoded marker adhered onto a top surface of each participant and / or game object to be uniquely identified, prior to the predefined time, that reflects, retroreflects or fluoresces energy;

generating a first video stream of images using a first set of two or more stationary cameras that together form a contiguous view that entirely covers the playing area, where the first set of cameras capture video continuously throughout the entire game;

simultaneously analyzing the continuous images from each first camera in order to detect the presence of any one or more participants and / or game objects within each and every camera's view, to determine each detected participant's and / or game object's relative centroid X, Y location within that view, to recognize the encoded markers adhered onto a top surface of each participant thereby determining each

participant's unique identity, where dimensional characteristics of each detected participant and / or game object, such as its size, may also be determined during the process, and for continuously throughout the entire game combining this determined information from each and every first set camera into a tracking database of at least the ongoing centroid X, Y coordinates of each one or more marked participants and / or game objects matched with their identities, as well as the ongoing centroid X, Y coordinates of one or more non-marked game objects, all relative to the entire playing area.

Claim 122. (New) The method of claim 121 for further automatically videoing the one or more participants as well as game objects as they move about within the predefined playing area, during the predefined time, further comprising the step of:

dynamically adjusting the current view of each one or more cameras in a second set of movable cameras, distinct from the first set of stationary cameras, wherein each movable camera is automatically directed based upon the tracking database without user intervention to maintain an independent view of one or more participants and / or game objects, where the second set of movable cameras continuously outputs a second stream of video images.

Claim 123. (New) The system of claim 122 for further providing a three dimensional model of the activities of at least the participants, further comprising the steps of:

adhering markers onto one or more locations on each participants and / or game objects to be modeled that reflect, retroreflect or fluoresce energy, where the energy is detectable by the first and / or second set of cameras, and

detecting the adhered markers within either or both the first and second streams of video images and updating the tracking database with related X, Y and Z coordinates of each detected marker for forming the three dimensional model of at least the participant's activities.

Claim 124. (New) The method of claim 123 wherein the markers reflect, retroreflect or fluoresce primarily non-visible energy and are therefore substantially visibly transparent, further comprising the step of:

using one or more energy sources to emit non-visible energy throughout the playing area that is reflected or retroreflected off of the markers, or emitting energy throughout